

(1)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 276 501
A2

(2)

EUROPEAN PATENT APPLICATION

(12) Application number: 87201851.0

(13) Int. Cl.⁴ **C11D 1/42**, C11D 1/58,
C11D 3/34, C11D 17/00

(22) Date of filing: 26.09.87

(18) Priority: 24.01.87 EP 87200096

(19) Date of publication of application:
03.08.88 Bulletin 88/31

(20) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(11) Applicant: AKZO N.V.
Velperweg 76
NL-6824 BM Arnhem(NL)

(12) Inventor: Rörlg, Hans
Am Olligsmaar 26
D-5161 Merzenich(DE)
Inventor: Porta, Norbert
Kurfürstenstrasse 20
D-5164 Nörvenich(DE)

(14) Representative: Sieders, René et al
AKZO N.V. Patent Department (Dept. CO)
P.O. Box 9300
NL-6800 SB Arnhem(NL)

(60) Thickening compositions and thickened aqueous acid solutions.

(17) The invention relates to a thickened aqueous composition incorporating an amine or diamine, carrying at least one nitrogen linked hydrocarbon group which represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 16-24 carbon atoms or an aryl, aralkyl or alkaryl group containing up to 24 carbon atoms, and wherein the optional other nitrogen linked groups are formed by optionally substituted alkyl groups, aryl groups or aralkyl groups or polyalkoxy groups, or wherein the amine is in the form of a heterocyclic ring, containing at least two nitrogen atoms, one of which being substituted by amino (lower) alkyl or hydroxy (lower) alkyl, while the ring is further bearing a linear or branched alkyl or alkenyl preferably reacted with fatty acids, or alkenyl group having at least 10 carbon atoms; cumene sulphonate, xylene sulphonate, toluene sulphonate or mixtures thereof, in their acid or salt form; and a weak acid having a pK value > 2.0; and water, wherein optionally one or more cleaning disinfecting and/or odorizing agents may be dissolved or dispersed.

The invention also relates to premix compositions composed of above-mentioned amines and sulphonates, from which the thickened aqueous compositions can be prepared by dilution with water or an aqueous solution or suspension and to a process for cleaning non-horizontal surfaces.

EP 0 276 501 A2

Thickening compositions and thickened aqueous acid solutions

Field of the invention

- The invention relates to thickened aqueous compositions incorporating low levels of amines or amine derivatives and low molecular weight aromatic sulphonates and displaying pronounced shear thinning behaviour, i.e., exhibiting high viscosities at low rates of shear.
- This type of behaviour is of particular advantage to cleaning compositions intended to be applied to non-horizontal structural surfaces such as walls and windows and sanitary fittings such as sinks, baths, showers, wash basins and lavatories.
- The invention is especially concerned with aqueous acid-containing cleaning compositions which are commonly applied to the surfaces of sanitary fittings.

Background of the invention

- It is well known that the higher the viscosity of a liquid composition, the greater will be its residence time when applied to a non-horizontal surface such as a wall. This viscosity can be increased in many ways. Especially for compositions containing a hypochlorite bleach, a variety of formulations have been proposed, but thickening systems have also been proposed for aqueous cleaning compositions of a pH not higher than 7.0. GB 1 240 469, for instance, discloses compositions, suitable for cleaning metal, glass and painted surfaces, which compositions have a pH not higher than 7.0 and comprise (a) an inorganic acid, an organic acid or an acidic salt (b) a cationic detergent and (c) a water insoluble or partially water soluble covalent compound other than the compounds under (b) and which contains oxygen or halogen and at least one hydrocarbon chain of at least four carbon atoms.
- As component (c) can more particularly be used an ester of an inorganic acid, a fatty acid or an ester of a fatty acid, a carboxylic acid ester in which the hydrocarbon chain derived from the alcohol has at least four carbon atoms, an alkyl chloride, a hydroxyl compound or substituted hydroxy compound, and the hydroxy compound is preferably water insoluble, such as a fatty alcohol, containing from 4-30 carbon atoms in at least one alkyl chain.
- A cationic detergent only an amine oxide of a special structure is mentioned, which is exemplified by a large number of representatives, the actual application of quaternary ammonium salts being neither disclosed in general terms, nor in specifically exemplified representatives.
- US Patent Specification 3 997 453 discloses a stable, cold water dispersible fabric softening composition comprising from about 60 to 20% by weight of a cationic quaternary ammonium softener, an organic anionic sulphonate, the weight ratio of the cationic softener to the anionic detergent being from about 40:1 to 5:1, and wherein the anionic sulphonate is selected from benzene or naphthalene sulphonate or a polyalkyl substituted aromatic sulphonate with one of the alkyl groups having not more than 18 C-atoms and each of the remaining alkyl groups has not more than 2 carbon atoms.
- Considering the statements in US Patent Specification 3 997 453, lines 42-45 and lines 57-64 of column, it is clear that a person skilled in the art would only be led away from trying to use combinations of cationic quaternary compounds and an anionic sulphonate as thickening composition. A person skilled in the art was even fortified in that prejudice on account of Kunishov et al, Ir. Mezhdunar. Kongr. Paverkhn. - Akt. Veshchestvam, 7 th 1976 (publ. 1978), 3, 150-8, Nats. Komm. SSSR Poverchn. - Akt. Veshchestvam Moscow, USSR.
- British Patent Application No. 2 010 892 discloses an aqueous liquid detergent composition especially adapted for dishwashing, comprising 5-60% by weight of an organic synthetic surfactant system of at least two surfactants and 5-50% by weight of citrus juice, said organic synthetic surfactant system consisting of
- 1) from 30-90 parts by weight of the surfactant system of a calcium sensitive anionic surfactant selected from the group consisting of water-soluble C_8-C_{18} alkyl benzene sulphonates, alkane sulphonates having 8-20 carbon atoms, olefin sulphonates having 8-20 carbon atoms, di- C_{12-18} alkyl sulphosuccinates, di- C_{12-18} alkylphenol sulphosuccinates, primary and secondary alkyl sulphates having 8-20 carbon atoms, C_{8-20} alkyl polyethoxy sulphates having 1-25 ethoxygroups and mixtures thereof;
 - 2) from about 7-10 parts by weight of a less calcium sensitive second surfactant selected from the group consisting of water-soluble nonionic condensation products obtained by condensing from 5-30 moles of an alkylene oxide, preferably ethylene or propylene oxide, with one mole of a hydrophobic compound

having 8-24 carbon atoms and at least one reactive hydrogen atom, e.g., an amino group. According to page 3, lines 2-4, as additional optional ingredients can be added; hydrotropes and solubilizing agents such as sodium or potassium toluene sulphonate and sodium or potassium xylene sulphonate, which are generally added to promote phase stability, especially of compositions with high concentrations of surfactants.

However, considering these afore-mentioned statements in GB-A-2 010 892, it is clear that a person skilled in the art when looking for thickening compositions, would only be led away from trying to prepare thickening compositions based on the use of solubilizing viscosity decreasing cumene, toluene or xylene sulphonates, having moreover in mind the prejudice as mentioned hereinbefore on page 2.

A similar picture may be derived by a person skilled in the art from European Patent Application No. 0 172 534, disclosing compositions for cleaning hard surfaces, having a content of (a) non-ionic adducts of ethylene oxide to aliphatic vicinal hydroxyamine with a linear alkyl chain of 10 to 20 carbon atoms (b) anionic surfactants (consisting of linear alkylbenzene sulphonate or linear alkane sulphonate with 8-20 carbon atoms in the alkyl residue) and optionally other usual components of such compositions, wherein the amount of adduct of 3-20 moles of ethylene oxide and the sulphonate is 2 to 30% by weight and wherein the ratio of a:b is from 1:1 to 1:15.

According to page 5, citric acid, tartaric acid, benzene hexacarboxylic acid, phosphoric acid, lactic acid, and the like, may be added to these compositions.

Moreover, European Patent Application No. 0 172 534 on page 5 states that known hydrotrophe compounds, e.g., lower alkyl arylsulphonate such as toluene, xylene or cumene sulphonate, may be added as such or in the salt form.

As result of extensive research and experimentation it has surprisingly been found now that improved thickened aqueous phase cleaning compositions could be obtained, which comprise

a) 0,1-50% by weight of a weak acid, having a pK value > 2,0;

b) from 0,1 to 20% by weight of an amine, more particularly selected from primary, secondary or tertiary amines and diamines carrying at least one nitrogen linked hydrocarbon group, which represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 18-24 carbon atoms, or an aryl, aralkyl or alkaryl group containing up to 24 carbon atoms, and wherein the optional other nitrogen linked groups are formed by optionally substituted alkyl groups, aryl groups or aralkyl groups or polyalkoxy groups and preferably polyethoxy or polypropoxy groups, containing at most 5 alkoxy groups and more preferably 1-3, or wherein the amine is in the form of a heterocyclic ring, containing at least two nitrogen atoms, one of which being substituted by amino (lower) alkyl or hydroxy (lower) alkyl, preferably reacted with fatty acids, with the ring further carrying a linear or branched alkyl or alkenyl group having at least 10 carbon atoms;

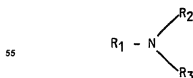
c) from 0,01% to 5% by weight of an organic, anionic sulphonate selected from the group consisting of cumene sulphonate, xylene sulphonate, and toluene sulphonate, in their acid or salt form, and mixtures thereof; and

d) water at 100% by weight, wherein optionally one or more additional cleaning, disinfecting and/or odorizing agents may be dissolved in minor amounts, the percentages by weight being calculated on the weight of the total aqueous composition.

A preferred embodiment of the afore-defined compositions is formed by thickened aqueous cleaning compositions having a pH from 0,5-4, containing 1-10% by weight of the amine and containing 1-10% by weight of an acid having a pK value of 2,8-5,5 and preferably 3,0-5,0. More specifically an acid selected from the group consisting of formic acid, citric acid, tartaric acid, succinic acid, adipic acid, acetic acid, phosphoric acid, sulphamic acid, glutaric acid, and lactic acid used. Most preferred are the compositions containing formic acid or citric acid.

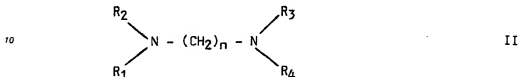
Examples of additional cleaning, disinfecting and/or odorizing agents are detergent builder salts, perfumes, antibiotics or auxiliary detergents, which may normally be used in an amount of up to 5% by weight.

Specific classes of the amines as specified under (b) can be represented by the following formulae:



I

wherein R₁ represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 16-24 carbon atoms, or an aryl, aralkyl or alkaryl group containing up to 24 carbon atoms, wherein R₂ and R₃ may be the same or different and represent hydrogen, an alkyl group, and preferably a lower alkyl group containing 1-4 carbon atoms and more preferably a methyl group, or poly-(alkoxy) group, preferably a poly(ethoxy) or poly(propoxy) group, wherein more preferably the number of ethoxy or propoxy radicals is at most 5, or



wherein R₁ is as defined before and R₂, R₃ and R₄ may be the same or different and represent hydrogen, alkyl, poly(ethoxy) or poly(propoxy) groups, and n is a number from 1 to 6 and more preferably 2-4, or



wherein R₁ is a hydroxyalkyl or amino alkyl group containing 1-4 carbon atoms, preferably reacted with a saturated or unsaturated fatty acid with 8-20 carbon atoms and R₂ is an alkyl or alkenyl group, linear or branched, with 8-20 carbon atoms.

A class of more specific examples of the amines as defined hereinbefore comprises:

oleyl amine,
 stearyl amine,
 tallow amine,
 hydrogenated tallow amine,
 lauryl amine,
 myristyl amine,
 cetyl amine, and
 soja alkyl amine or mixtures thereof.

A preferred group of these compounds comprises oleyl amine and tallow amine.

According to another embodiment of the present compositions, a typical class of amines as defined hereinbefore, comprises:

bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxyethyl ethoxy)oleyl amine,
 bis(2-hydroxyethyl tetra(ethoxy))oleyl amine,
 bis(2-hydroxyethyl)stearyl amine,
 bis(2-hydroxyethyl ethoxy)stearyl amine,
 bis(2-hydroxyethyl tetra(ethoxy))stearyl amine,
 bis(2-hydroxyethyl) tallow amine,
 bis(2-hydroxyethyl)hydrogenated tallow amine,
 bis(2-hydroxyethyl tetra(ethoxy))tallow amine,
 bis(2-hydroxyethyl)lauryl amine,
 bis(2-hydroxyethyl)myristyl amine,
 bis(2-hydroxyethyl)soja alkyl amine,
 bis(2-hydroxyethyl ethoxy)soja alkyl amine,
 bis(2-hydroxyethyl tri(ethoxy))soja alkyl amine,
 bis(2-hydroxyethyl tri(ethoxy))lauryl amine,
 bis(2-hydroxyethyl di(ethoxy))lauryl amine,
 bis(2-hydroxyethyl ethoxy)lauryl amine,
 bis(2-hydroxyethyl ethoxy)myristyl amine,
 bis(2-hydroxyethyl)cetyl amine,

- bis(2-hydroxyethyl ethoxy)cetyl amine,
 bis[2-hydroxyethyl tri(ethoxy)]cetyl amine,
 bis[2-hydroxyethyl tri(ethoxy)]lauryl amine,
 bis[2-hydroxyethyl tri(ethoxy)]myristyl amine,
 5 bis[2-hydroxyethyl di(ethoxy)]tallow amine,
 bis(2-hydroxyethyl tri(ethoxy)]tallow amine,
 bis[2-hydroxyethyl tri(ethoxy)]oleyl amine,
 bis(2-hydroxyethyl tri(ethoxy)]stearyl amine,
 bis(2-hydroxypropyl)oleyl amine,
 10 bis(2-hydroxypropyl)stearyl amine,
 bis(2-hydroxypropyl)tallow amine,
 bis(2-hydroxypropyl)hydrogenated tallow amine,
 bis(2-hydroxypropyl)lauryl amine,
 bis(2-hydroxypropyl)myristyl amine,
 15 bis(2-hydroxypropyl)cetyl amine,
 bis(2-hydroxypropyl)soja alkyl amine,
 bis(2-hydroxypropyl propoxy)oleyl amine
 bis(2-hydroxypropyl propoxy)soja alkyl amine,
 bis(2-hydroxypropyl propoxy)stearyl amine,
 20 bis(2-hydroxypropyl propoxy)tallow amine,
 bis(2-hydroxypropyl propoxy)hydrogenated tallow amine,
 bis(2-hydroxypropyl propoxy)lauryl amine,
 bis(2-hydroxypropyl propoxy)myristyl amine,
 bis(2-hydroxypropyl propoxy)cetyl amine,
 25 bis[2-hydroxypropyl di(propoxy)]oleyl amine,
 bis[2-hydroxypropyl di(propoxy)]stearyl amine,
 bis[2-hydroxypropyl di(propoxy)]tallow amine,
 bis[2-hydroxypropyl di(propoxy)]hydrogenated tallow amine,
 bis[2-hydroxypropyl di(propoxy)]lauryl amine,
 30 bis[2-hydroxypropyl di(propoxy)]myristyl amine,
 bis[2-hydroxypropyl di(propoxy)]soja alkyl amine,
 bis[2-hydroxypropyl di(propoxy)]cetyl amine,
 bis[2-hydroxypropyl tri(propoxy)]oleyl amine,
 bis[2-hydroxypropyl tri(propoxy)]soja alkyl amine,
 35 bis[2-hydroxypropyl tri(propoxy)]stearyl amine,
 bis[2-hydroxypropyl tri(propoxy)]tallow amine,
 bis[2-hydroxypropyl tri(propoxy)]hydrogenated tallow amine,
 bis[2-hydroxypropyl tri(propoxy)]lauryl amine,
 bis[2-hydroxypropyl tri(propoxy)]myristyl amine,
 40 bis[2-hydroxypropyl tetra(propoxy)]cetyl amine,
 bis[2-hydroxypropyl tetra(propoxy)]oleyl amine, bis[2-hydroxypropyl tetra(propoxy)]soja alkyl amine,
 bis[2-hydroxypropyl tetra(propoxy)]stearyl amine,
 bis[2-hydroxypropyl tetra(propoxy)]tallow amine,
 bis[2-hydroxypropyl tetra(propoxy)]hydrogenated tallow amine,
 45 bis[2-hydroxypropyl tetra(propoxy)]lauryl amine,
 bis[2-hydroxypropyl tetra(propoxy)]myristyl amine, and
 bis[2-hydroxypropyl tetra(propoxy)]cetyl amine or mixtures thereof.
 A preferred group of these compounds is comprising:
 bis(2-hydroxyethyl)tallow amine,
 50 bis(2-hydroxyethyl)hydrogenated tallow amine,
 bis(2-hydroxyethyl)soja alkyl amine,
 bis(2-hydroxyethyl)cetyl amine,
 bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxypropyl)tallow amine,
 55 bis(2-hydroxypropyl)hydrogenated tallow amine,
 bis(2-hydroxypropyl)soja alkyl amine,
 bis(2-hydroxypropyl)cetyl amine,
 bis(2-hydroxypropyl)oleyl amine.

bis(2-hydroxypropyl ethoxy)tallow amine,
 bis(2-hydroxyethyl ethoxy)hydrogenated tallow amine,
 bis(2-hydroxypropyl ethoxy)soja alkyl amine,
 bis(2-hydroxypropyl ethoxy)cetyl amine,
 5 bis(2-hydroxypropyl ethoxy)oleyl amine,
 bis(2-hydroxyethyl propoxy)tallow amine,
 bis(2-hydroxyethyl propoxy)hydrogenated tallow amine,
 bis(2-hydroxyethyl propoxy)soja alkyl amine,
 bis(2-hydroxyethyl propoxy)cetyl amine, and
 10 bis(2-hydroxyethyl propoxy)oleyl amine or mixtures thereof.

Most preferably

bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxyethyl)tallow amine, and
 15 bis(2-hydroxyethyl)tallow amine are used.

According to another embodiment of the present compositions, a typical specific class of amines as defined hereinbefore, comprises:

N,N-dimethyl oleyl amine,
 N,N-diethyl oleyl amine,
 20 N,N-dibenzyl oleyl amine,
 N,N-difenyl oleyl amine,
 N,N-dipropyl oleyl amine,
 N,N-dimethyl stearyl amine,
 N,N-diethyl stearyl amine,
 25 N,N-dipropyl stearyl amine,
 N,N-dibenzyl stearyl amine,
 N,N-difenyl stearyl amine,
 N,N-dimethyl (hydrogenated) tallow amine,
 N,N-diethyl (hydrogenated) tallow amine,
 30 N,N-dipropyl (hydrogenated) tallow amine,
 N,N-dibenzyl (hydrogenated) tallow amine,
 N,N-difenyl (hydrogenated) tallow amine,
 N,N-dimethyl soja alkyl amine,
 N,N-diethyl soja alkyl amine,
 35 N,N-dipropyl soja alkyl amine,
 N,N-dibenzyl soja alkyl amine,
 N,N-difenyl soja alkyl amine,
 N,N-dimethyl lauryl amine,
 N,N-diethyl lauryl amine,
 40 N,N-dipropyl lauryl amine,
 N,N-dibenzyl lauryl amine,
 N,N-difenyl lauryl amine,
 N,N-dimethyl myristyl amine, N,N-diethyl myristyl amine,
 N,N-dipropyl myristyl amine,
 45 N,N-dibenzyl myristyl amine,
 N,N-difenyl myristyl amine,
 N,N-dimethyl cetyl amine,
 N,N-diethyl cetyl amine,
 N,N-dipropyl cetyl amine,
 50 N,N-dibenzyl cetyl amine, and
 N,N-difenyl cetyl amine or mixtures thereof.

A preferred group of the later class comprises:

N,N-dimethyl oleyl amine,
 N,N-dimethyl lauryl amine,
 55 N,N-dimethyl cetyl amine,
 N,N-dimethyl myristyl amine,
 N,N-dimethyl soja alkyl amine,
 N,N-dimethyl tallow amine, and

N,N-dimethyl stearyl amine or mixtures thereof.

Most preferably

N,N-dimethyl oleyl amine,

N,N-dimethyl tallow amine, and

5 N,N-dimethyl soja alkyl amine are used.

According to another embodiment of the present compositions, a typical specific class of amines as defined hereinbefore, comprises:

N-oleyl-1,3-diaminopropane,

N-stearyl-1,3-diaminopropane,

10 N-(hydrogenated)tallow-1,3-diaminopropane,

N-soja alkyl-1,3-diaminopropane,

N-lauryl-1,3-diaminopropane,

N-myristyl-1,3-diaminopropane,

N-cetyl-1,3-diaminopropane,

15 N-oleyl-1,4-diaminobutane,

N-stearyl-1,4-diaminobutane,

N-(hydrogenated)tallow-1,4-diaminobutane,

N-soja alkyl-1,4-diaminobutane,

N-lauryl-1,4-diaminobutane,

20 N-myristyl-1,4-diaminobutane,

N-cetyl-1,4-diaminobutane,

N-oleyl-1,5-diaminopentane,

N-stearyl-1,5-diaminopentane

N-(hydrogenated)tallow-1,5-diaminopentane,

25 N-soja alkyl-1,5-diaminopentane,

N-lauryl-1,5-diaminopentane,

N-myristyl-1,5-diaminopentane, and

N-cetyl-1,5-diaminopentane or mixtures thereof.

A preferred group of the latter group comprises:

30 N-oleyl-1,3-diaminopropane,

N-oleyl-1,4-diaminobutane,

N-tallow-1,3-diaminopropane,

N-tallow-1,4-diaminobutane,

N-stearyl-1,3-diaminopropane, and

35 N-stearyl-1,4-diaminobutane.

Most preferably

N-oleyl-1,3-diaminopropane,

N-oleyl-1,4-diaminobutane,

N-tallow-1,3-diaminopropane, and

40 N-tallow-1,4-diaminobutane are used.

According to another embodiment of the present compositions, a typical specific class of amines as defined hereinbefore, comprises:

2-oleyl-1-aminoethyl-4,5-dihydro imidazole,

2-stearyl-1-aminoethyl-4,5-dihydro imidazole,

45 2-(hydrogenated)tallow-1-aminoethyl-4,5-dihydro imidazole,

2-soja alkyl-1-aminoethyl-4,5-dihydro imidazole,

2-lauryl-1-aminoethyl-4,5-dihydro imidazole,

2-myristyl-1-aminoethyl-4,5-dihydro imidazole,

2-cetyl-1-aminoethyl-4,5-dihydro imidazole,

50 2-oleyl-1-amino-n-propyl-4,5-dihydro imidazole,

2-stearyl-1-amino-n-propyl-4,5-dihydro imidazole,

2-(hydrogenated)tallow-1-amino-n-propyl-4,5-dihydro imidazole,

2-soja-alkyl-1-amino-n-propyl-4,5-dihydro imidazole,

2-lauryl-1-amino-n-propyl-4,5-dihydro imidazole,

55 2-myristyl-1-amino-n-propyl-4,5-dihydro imidazole,

2-cetyl-1-amino-n-propyl-4,5-dihydro imidazole,

2-oleyl-1-amino-n-butyl-4,5-dihydro imidazole,

2-stearyl-1-amino-n-butyl-4,5-dihydro imidazole,

- 2-(hydrogenated)tallow-1-amino-n-butyl-4,5-dihydro imidazole,
 2-soja-alkyl-1-amino-n-butyl-4,5-dihydro imidazole,
 2-lauryl-1-amino-n-butyl-4,5-dihydro imidazole,
 2-myristyl-1-amino-n-butyl-4,5-dihydro imidazole,
 2-cetyl-1-amino-n-butyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-stearyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-(hydrogenated)tallow-1-hydroxyethyl-4,5-dihydro imidazole,
 2-soja-alkyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-lauryl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-myristyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-cetyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-stearyl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-(hydrogenated)tallow-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-soja-alkyl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-lauryl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-myristyl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-cetyl-1-hydroxy-n-propyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxy-n-butyl-4,5-dihydro imidazole,
 2-stearyl-1-hydroxy-n-butyl-4,5-dihydro imidazole,
 2-(hydrogenated)tallow-1-hydroxy-n-butyl-4,5-dihydro imidazole,
 2-soja-alkyl-1-hydroxy-n-butyl-4,5-dihydro imidazole,
 2-lauryl-1-hydroxy-n-butyl-4,5-dihydro imidazole,
 2-myristyl-1-hydroxy-n-butyl-4,5-dihydro imidazole, and
 2-cetyl-1-hydroxy-n-butyl-4,5-dihydro imidazole or mixtures thereof.
 A preferred group of the latter class comprises:
 2-oleyl-1-aminoethyl-4,5-dihydro imidazole,
 2-tallow-1-aminoethyl-4,5-dihydro imidazole,
 2-soja alkyl-1-aminoethyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-soja alkyl-1-hydroxyethyl-4,5-dihydro imidazole, and
 2-tallow-1-hydroxyethyl-4,5-dihydro imidazole.
 Most preferably
 2-oleyl-1-aminoethyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-tallow-1-aminoethyl-4,5-dihydro imidazole, and
 2-tallow-1-hydroxyethyl-4,5-dihydro imidazole are used.

The amines are more preferably used in amounts from 1 to 5% by weight based on the total weight of the composition, depending on the specific type of the agent and desired final viscosity.

Preferred embodiments of the present compositions are formed by those containing one or more salts of the sulphonates, specified under (c). Typical salts of the sulphonates, specified under (c) are the sodium, potassium, ammonium, and lower amine salts, of which the sodium salts are preferred. The sodium salt of xylene sulphonate is more preferred. The sulphonates are preferably used in amounts from 1 to 5% by weight, based on the total weight of the composition.

The composition according to the present invention exhibit a viscosity of at least 200 mPa.s at 20°C. For compositions exhibiting optimum thickening effects, the ratio of the weights of, e.g., the amine and the sulphonate is in the range from 0,1-6 and preferably from 1,5-3 and more preferably around about 2,5.

A more preferred embodiment of the thickened cleaning compositions of the present invention is formed by a thickened cleaning composition which comprises:

- a) 10% by weight of formic acid or citric acid,
- b) 2% by weight of N,N-dimethyl oleyl amine or bis(2-hydroxyethyl)oleyl amine or N-oleyl-1,3-diaminopropane,
- c) 2% by weight of sodium xylene sulphonate (40%),
- d) 0,2% by weight of methylsalicylate as perfume, and
- e) water to 100% showing a viscosity, measured by means of a Brookfield LVT, 60 rpm at 20°C, of 550-1000 mPa.s.

It will be appreciated that another aspect of the invention is formed by a premix compositions for the

preparation of the afore-described thickened aqueous compositions by dilution with water, optionally, containing other desired ingredients, which comprise at least:

- i) an amine as specified hereinbefore under (b);
- ii) an organic anionic sulphonate as specified hereinbefore under (c).

5 It will be appreciated that the thickened aqueous compositions according to the present invention may be prepared by dilution of such a premix composition with water, containing the desired amount of weak acid and of other desired minor ingredients. According to an alternative embodiment of the preparation of the finally used thickened aqueous compositions, the weak acid independently may be added to the premix before or after the addition of water.

10 The thickening systems described above display a viscosity temperature relationship that has a parabolic profile with the maximum viscosity being obtained at a temperature in the range from 0°C to 30°C. An increase in chain length of the higher alkyl chain in the amine will in general cause the temperature at which this peak occurs to be higher, whereas a reduction of this higher alkyl chain length and/or branching of this alkyl chain, causes the temperature at which the maximum viscosity is produced by the system to be lower.

15 It will be appreciated by persons skilled in the art that an ideal situation, wherein the viscosity of the composition should be independent of the temperature over a temperature range which encompasses the practical domestic use conditions, i.e., from 5°-25°C, is approached most closely by the compositions of the present invention, employing a blend of specific amines and specific sulphonates, the application of which would certainly be rejected by persons skilled in the art.

20 It will be appreciated by persons skilled in the art that the optimum characteristics of the compositions of the present invention will be governed by the specific kind of amine, kind of sulphonate, kind of acid in the composition, amount of acid electrolyte concentration in total composition, ratio of weights of the amine-sulphonate combination and counter ion of the sulphonates.

25 Another feature of the present invention is formed by the application of the thickened aqueous single phase compositions according to the usual methods of this specific art of cleaning non-horizontal surfaces such as walls, windows and sanitary fittings.

The invention is illustrated by the following examples without restricting the scope of these embodiments.

30

Example 1

35 Preparation of thickened cleaning composition comprising formic acid, sodium xylene sulphonate, and N,N-dimethyl oleyl amine.

Formic acid (10 g) was dissolved in about 86 ml of demineralized water with stirring at 20°C, whereafter 2 g of N,N-dimethyloleyl amine (Armeen DMOD®) were added, followed by the addition, with continued stirring, of 2 g of sodium xylene sulphonate (40%, i.e. added in the form of a 40% by weight solution).

40 During the addition of the sulphonate the viscosity immediately increased and was finally 990 mPa.s, measured by means of a Brookfield LVT, 60 rpm, viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 2

45 By a method similar to Example 1, an aqueous composition was prepared from 10 g of formic acid in 86 ml of demineralized water, 2 g of N,N-dimethyl oleyl amine, 1.75 g of sodium xylene sulphonate (40%) and 0.25 g of methyl salicylate as perfume. During the addition of the sulphonate the viscosity immediately increased and was finally 550 mPa.s, measured by means of a Brookfield LVT, 60 rpm, viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 3

55 By a method similar to Example 1, an aqueous composition was prepared from 10 g of formic acid in 86 ml of demineralized water, 2 g of bis(2-hydroxyethyl)oleyl amine and 2 g of sodium xylene sulphonate (40%). The solution had a viscosity of 660 mPa.s, measured by means of Brookfield LVT 60 rpm, viscosimeter at 20°C. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 4

By a method similar to Example 1, an aqueous composition was prepared from 5g of hydrated citric acid in 92 ml of demineralized water, 1.5g of bis(hydroxyethyl)oleyl amine and 1.5g of sodium xylene sulphate (40%). The solution had a viscosity of 570 mPa.s measured by means of a Brookfield LVT, 60rpm, viscosimeter at 20°C. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 5

By a method similar to Example 1, an aqueous composition was prepared from 5g of hydrated citric acid in 92ml of demineralized water, 1g of N-oleyl-1,3-diaminopropane and 2g of sodium xylenesulphonate (40%). The solution had a viscosity of 200 mPa.s measured by means of a Brookfield LVT, 60 rpm, viscosimeter at 20°C. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 6

By a method similar to Example 1, an aqueous composition was prepared from 5 g of hydrated citric acid in 91.5 ml of demineralized water, 2.0 g of N,N-dimethyl oleyl amine, 1.5 g of sodium xylene sulphate (40%). The solution had a viscosity of 660 mPa.s at 20°C, measured by means of a Brookfield LVT, 60 rpm, viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 7

By a method similar to Example 1, an aqueous composition was prepared from 10 g formic acid in 86 ml of demineralized water, 1.5 g of soja alkyl amine (Armeen® OD) and 2.5 g of sodium cumenesulphonate (40%). The solution had a viscosity of 210 mPa.s at 20°C, measured by means of a Brookfield LVT, 60 rpm viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 8

By a method similar to In Example 1, an aqueous composition was prepared from 5 g of lactic acid in 92.7 ml of demineralized water, 1 g of bis(2-hydroxyethyl)oleyl amine, 1.3 g of sodium xylenesulphonate (40%). The solution had a viscosity of 310 mPa.s at 20°C, measured by means of a Brookfield LVT, 60 rpm viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 9

By a method similar to Example 1, an aqueous composition was prepared from 5 g of tartaric acid in 92.8 ml of demineralized water, 1 g of bis(2-hydroxyethyl)oleyl amine and 1.2 g of sodium xylene sulphate (40%). The solution has a viscosity of 250 mPa.s at 20°C, measured by means of a Brookfield LVT, 60 rpm viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 10

By a method similar to Example 1, an aqueous composition was prepared from 10 g of acetic acid in 86.8 ml of demineralized water, 1.5 g of bis(2-hydroxyethyl)oleyl amine and 1.7 g of sodium xylene sulphate (40%). The solution had a viscosity of 200 mPa.s at 20°C measured by means of a Brookfield LVT, 60 rpm viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

Example 11

By a method similar to Example 1, an aqueous composition was prepared from 10 g formic acid in 83 ml of demineralized water, 2 g of bis(2-hydroxyethyl)oleyl amine, 0,1 g methyl salicylate and 2,8 g potassium-paratoluene sulphonate (40%). The solution had a viscosity of 205 m Pa.s at 20°C measured by means of a Brookfield LVT, 60 rpm viscosimeter. The solution obtained was perfectly clear and stable at elevated temperature (40°C).

10 **Claims**

1. Thickened aqueous compositions, comprising

a) 0,1-50% by weight of a weak acid, having a pK value > 2.0 and

b) from 0,1 to 20% by weight of an amine, more particularly selected from primary, secondary or tertiary amine or diamines, carrying at least one nitrogen linked hydrocarbon group, which represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 18-24 carbon atoms, or an aryl, aralkyl or alkaryl group containing up to 24 carbon atoms, and wherein the optional other nitrogen linked groups are formed by optionally substituted alkyl groups, aryl groups or aralkyl groups or polyalkoxy groups, preferably polyethoxy or polypropoxy groups, containing at most 5 alkoxy groups and more preferably 1-3, or wherein the amine is in the form of a heterocyclic ring, containing at least two nitrogen atoms, one of which being substituted by amino (lower) alkyl or hydroxy (lower) alkyl, preferably reacted with fatty acids, with the ring further carrying a linear or branched alkyl or alkenyl group having at least 10 carbon atoms;

c) from 0,01% to 5% by weight of an organic, anionic sulphonate selected from the group consisting of cumene sulphonate, xylene sulphonate, and toluene sulphonate, in their acid or salt form, and mixtures thereof;

d) water, wherein optionally one or more additional cleaning, disinfecting and/or odorizing agents may be dissolved in minor amounts, the percentages by weight being calculate on the weight of the total aqueous composition.

2. Thickened aqueous compositions according to claim 1, characterized that they have a pH of from 0,5-4.

3. Thickened aqueous compositions according to claim 1 or 2, characterized in that they contain 1-10% by weight of the amine.

4. Thickened aqueous compositions according to any one of the preceding claims, characterized in that an acid of a pK value of from 2,8-5,5 and more preferably 3,0-5,0 is used.

5. Thickened aqueous compositions according to any one of the preceding claims, characterized in that they contain 1-10% by weight of an acid selected from the group consisting of formic acid, citric acid, tartaric acid, succinic acid, adipic acid, acetic acid, phosphoric acid, sulphamic acid, glutaric acid and lactic acid.

6. Thickened aqueous compositions according to any one the preceding claims, characterized in that they contain formic acid or citric acid.

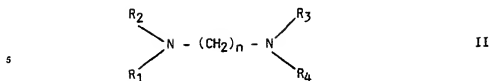
7. Thickened aqueous compositions according to any one of the preceding claims, characterized in that they contain amines according to the formulae:



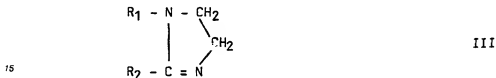
I

wherein R₁ represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 18-24 carbon atoms, or an aryl, aralkyl or alkaryl group containing up to 24 carbon atoms,

wherein R₂ and R₃ may be the same or different and represent hydrogen, an alkyl group, and preferably a lower alkyl group containing 1-4 carbon atoms and more preferably a methyl group or poly(alkoxy) group, preferably a poly(ethoxy) or poly(propoxy) group, wherein more preferably the number of ethoxy or propoxy radicals is at most 5, or



wherein R₁ is as defined before and R₂, R₃ and R₄ may be the same or different and represent hydrogen, alkyl, poly(ethoxy) or poly(propoxy) groups, and n is a number from 1 to 6 and more preferably 2-4, or



wherein R₁ is a hydroxyalkyl or amino alkyl group containing 1-4 carbon atoms, preferably reacted with saturated or unsaturated fatty acid with 8-20 carbon atoms and R₂ is an alkyl or alkenyl group, linear or branched, with 8-20 carbon atoms.

8. Thickened aqueous composition according to any one of the preceding claims, characterized in that they contain an amine selected from the group consisting of:

bis(2-hydroxyethyl)tallow amine,
 bis(2-hydroxyethyl)hydrogenated tallow amine,
 bis(2-hydroxyethyl)soja alkyl amine,
 bis(2-hydroxyethyl)cetyl amine,
 bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxypropyl)tallow amine,
 bis(2-hydroxypropyl)hydrogenated tallow amine,
 bis(2-hydroxypropyl)soja alkyl amine,
 bis(2-hydroxypropyl)cetyl amine,
 bis(2-hydroxypropyl)oleyl amine,
 bis(2-hydroxyethyl ethoxy)tallow amine,
 bis(2-hydroxyethyl ethoxy)hydrogenated tallow amine,
 bis(2-hydroxyethyl ethoxy)soja alkyl amine,
 bis(2-hydroxyethyl ethoxy)cetyl amine,
 bis(2-hydroxyethyl ethoxy)oleyl amine,
 bis(2-hydroxyethyl propoxy)tallow amine,
 bis(2-hydroxyethyl propoxy)hydrogenated tallow amine,
 bis(2-hydroxyethyl propoxy)soja alkyl amine,
 bis(2-hydroxyethyl propoxy)cetyl amine, and
 bis(2-hydroxyethyl propoxy)oleyl amine or mixtures thereof.

9. Thickened aqueous compositions according to claim 8, characterized in that they contain an amine selected from the group consisting of:

bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxyethyl)oleyl amine,
 bis(2-hydroxyethyl)tallow amine, and
 bis(2-hydroxyethyl)tallow amine

10. Thickened aqueous compositions according to any one of the claims 1 through 7, characterized in that they contain an amine selected from the group consisting of:

N,N-dimethyl oleyl amine,
 N,N-dimethyl lauryl amine,
 N,N-dimethyl cetyl amine,
 N,N-dimethyl myristyl amine,
 N,N-dimethyl soja alkyl amine,
 N,N-dimethyl tallow amine, and
 N,N-dimethyl stearyl amine and mixtures thereof.

11. Thickened aqueous compositions according to claim 10, characterized in that they contain an amine selected from the group consisting of:
 N,N-dimethyl oleyl amine,
 N,N-dimethyl tallow amine, and
 N,N-dimethyl soja alkyl amine.
12. Thickened aqueous compositions according to any one of the claims 1 through 7, characterized in that they contain an amine selected from the group consisting of:
 N-oleyl-1,3-diaminopropane,
 N-oleyl-1,4-diaminobutane,
 N-tallow-1,3-diaminopropane,
 N-tallow-1,4-diaminopropane,
 N-stearyl-1,3-diaminopropane, and
 N-stearyl-1,4-diaminobutane and mixtures thereof.
13. Thickened aqueous compositions according to claim 12, characterized in that they contain an amine selected from the group consisting of:
 N-oleyl-1,3-diaminopropane,
 N-oleyl-1,4-diaminobutane,
 N-tallow-1,3-diaminopropane, and
 N-tallow-1,4-diaminobutane.
14. Thickened aqueous compositions according to any one of the claims 1 through 7, characterized in that they contain an amine selected from the group consisting of:
 2-oleyl-1-aminoethyl-4,5-dihydro imidazole,
 2-tallow-1-aminoethyl-4,5-dihydro imidazole,
 2-soja alkyl-1-aminoethyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxyethyl-4,5-dihydroimidazole,
 2-soja alkyl-1-hydroxyethyl-4,5-dihydro imidazole, and
 2-tallow-1-hydroxyethyl-4,5-dihydro imidazole and mixtures thereof.
15. Thickened aqueous compositions according to claim 14, characterized in that they contain an amine selected from the group consisting of:
 2-oleyl-1-aminoethyl-4,5-dihydro imidazole,
 2-oleyl-1-hydroxyethyl-4,5-dihydro imidazole,
 2-tallow-1-aminoethyl-4,5-dihydro imidazole, and
 2-tallow-1-hydroxyethyl-4,5-dihydro imidazole.
16. Thickened aqueous compositions according to any one of the claims 1 through 7, characterized in that they contain an amine selected from the group consisting of:
 oleylamine,
 tallow amine,
 hydrogenated tallow amine,
 soja alkyl amine,
 cetyl amine,
 stearyl amine,
 lauryl amine, and
 myristyl amine and mixtures thereof.
17. Thickened compositions according to any one of the claims 1 through 7, characterized in that they contain an amine in an amount of from 1 to 5% by weight based on the total weight of the composition.
18. Thickened compositions according to any one of the claims 1 through 7, characterized in that they contain an sulphonate in an amount of from 1 to 5% by weight based on the total weight of the composition.
19. Thickened compositions according to any one of the claims 1 through 7, characterized in that they contain the sodium salt of xylene sulphonate.
20. Thickened compositions according to any one of the claims 1 through 7, characterized in that they contain an acid in an amount from 1-15% by weight, based on the weight of the total composition.
21. Premix compositions for the preparation of the thickened aqueous compositions according to any one of the claims 1 through 20 by dilution with water, optionally containing other desired ingredients, characterized in that they contain at least
- i) an amine, selected from primary, secondary or tertiary amines or diamines, carrying at least one nitrogen linked hydrocarbon group which represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 16-24 carbon atoms or an aryl, aralkyl or alkaryl containing up to 24 carbon atoms, and wherein the optional other nitrogen linked groups are formed by

optionally substituted alkyl groups, aryl groups or aralkyl groups or polyalkoxy groups, preferably polyethoxy or polypropoxy, containing at most 5 alkoxy groups and more preferably 1-3, or wherein the amine is in the form of a heterocyclic ring, containing at least two nitrogen atoms, one of which being substituted by amino (lower) alkyl or hydroxy (lower) alkyl, preferably reacted with fatty acids, while the ring is further bearing a linear or branched alkyl or alkenyl group having at least 10 carbon atoms;

(ii) an organic, anionic sulphonate selected from the group consisting of cumen sulphonate, xylene sulphonate, and toluene sulphonate, in their acid or salt form, and mixtures thereof.

22. Premix compositions according to claim 21, characterized in that the ratio of the weights of the amine to the sulphonate is in the range from 1.5-3 and more preferably around 2.5.

23. Premix compositions according to claim 21, characterized in that an amine is used selected according to any one of the preceding claims 8 through 16.

24. Premix compositions according to claim 23, characterized in that an amine is used selected according to any one of the preceding claims 9, 11, 13, 15 and 16.

25. Process for cleaning non-horizontal surfaces such as walls, windows and sanitary fittings by the application of the thickened aqueous single phase cleansing compositions according to any one of the preceding claims 1 through 20 by methods usual in the art.

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **87201851.0**

(51) Int. Cl.⁴: **C11D 1/42 , C11D 1/58 ,
C11D 3/34 , C11D 17/00**

(22) Date of filing: **26.09.87**

(24) Priority: **24.01.87 EP 87200096**

(26) Date of publication of application:
03.08.88 Bulletin 88/31

(28) Designated Contracting States:
AT BE CH DE ES FR GR IT LI LU NL SE

(29) Date of deferred publication of the search report:
16.08.89 Bulletin 89/33

(71) Applicant: **AKZO N.V.**
Velperweg 76
NL-6824 BM Arnhem(NL)

(72) Inventor: **Röhrig, Hans**
Am Olligsmoor 26
D-5161 Merzenich(DE)
Inventor: **Porta, Norbert**
Kurfürstenstrasse 20
D-5164 Nörvenich(DE)

(74) Representative: **Sieders, René et al**
AKZO N.V. Patent Department (Dept. CO)
P.O. Box 9300
NL-6800 SB Arnhem(NL)

(54) **Thickening compositions and thickened aqueous acid solutions.**

(57) The invention relates to a thickened aqueous composition incorporating an amine or diamine, carrying at least one nitrogen linked hydrocarbon group which represents a saturated or unsaturated linear or branched alkyl group having at least 10 carbon atoms and preferably 16-24 carbon atoms or an aryl, alkyl or alkaryl group containing up to 24 carbon atoms, and wherein the optional other nitrogen linked groups are formed by optionally substituted alkyl groups, aryl groups or aralkyl groups or polyalkoxy groups, or wherein the amine is in the form of a heterocyclic ring, containing at least two nitrogen atoms, one of which being substituted by amino (lower) alkyl or hydroxy (lower) alkyl, while the ring is further bearing a linear or branched alkyl or alkenyl preferably reacted with fatty acids, or alkenyl group having at least 10 carbon atoms; cumene sulphonate, xylene sulphonate, toluene sulphonate or mixtures thereof, in their acid or salt form; and

EP 0 276 501 A3

a weak acid having a pK value > 2.0; and water, wherein optionally one or more cleaning disinfecting and/or odourizing agents may be dis-

solved or dispersed.

The invention also relates to premix compositions composed of above-mentioned amines and sulphonates, from which the thickened aqueous compositions can be prepared by dilution with water or an aqueous solution or suspension and to a process for cleaning non-horizontal surfaces.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 87 20 1851

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-3 440 063 (B.A. CHESTOCHOWSKI et al.) * Column 4, lines 30-68; claims *	1-5,7,16	C 11 D 1/42 C 11 D 1/58 C 11 D 3/34 C 11 D 17/00
X	CHEMICAL ABSTRACTS, vol. 95, no. 26, December 1981, page 104, abstract no. 221718d, Columbus, Ohio, US; & ES-A-489 976 (F. COLGROS BOU) 01-04-1981 * Abstract *	1-3,8	
A	EP-A-0 199 383 (PROCTER & GAMBLE) * Examples; claims *	1	
A	FR-A-2 459 830 (INDUSTRIES CHIMIQUES DE VOREPPE) * Whole document *	1,5	
A	CHEMICAL ABSTRACTS, vol. 105, no. 20, November 1986, page 132, abstract no. 174867q, Columbus, Ohio, US; & DD-A-230 552 (VEB DOMAL STADTILM) 04-12-1985 * Abstract *	1	
A	FR-A-2 207 984 (RECKITT & COLMAN) * Claims *	1,7,8	TECHNICAL FIELDS SEARCHED (Int. Cl. 4) C 11 D
A	FR-A-2 415 139 (HALLIBURTON) * Claims *	1,7,8	
A	EP-A-0 206 375 (UNILEVER) * Claims *	1	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20-05-1989	Examiner GOLLER P.
CATEGORY OF CITED DOCUMENTS			
X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: non-written disclosure O: non-written disclosure F: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document	

EP 87 20 1851 (20/89)